What Works Case Study

WHAT WORKS: SCALING MICROFINANCE WITH THE REMOTE TRANSACTION SYSTEM

Increasing productivity and scale in rural microfinance

Cornell University
The Johnson School

NICOLAS MAGNETTE

DIGBY LOCK

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EXECUTIVE SUMMARY

In 2002, Hewlett Packard formed a partnership with a number of microfinance networks (MFIs) and commercial partners working in related areas to explore how technology could be used effectively to help scale microfinance. It was apparent that the microfinance industry faced major issues, including the lack of industry-wide standardization, high transaction costs, and the inability to reach out to rural areas. These challenges have limited the availability of microfinance services to about 70 million clients out of a potential market estimated at 500 million and an even larger "unbanked" population of more than a billion worldwide. The partnership—called the Microdevelopment Finance Team (MFT)—was quite successful at mobilizing resources from the United States Agency for International Development, leading academic institutions, and engaging a large management consulting firm. What emerged from the effort was a combination of technology and business processes, the *Remote Transaction System (RTS)*, that supports both group and individual lending, online and batch offline processing, and back office synchronization. This solution was intended to become an industry standard, help MFI reach isolated clients cost-effectively, and enable microfinance to reach a new stage of development.

The RTS is based on the use of sturdy hand-held devices that can communicate over GSM cellular networks. Combined with the use of smart cards given out to clients and microfinance agents, the system allows MFI agents to collect crucial financial data in the field and subsequently to transfer the data directly into the MFIs' computerized financial management systems. The RTS eliminates the need to prepare, transport, and enter hand-written reports, reducing costs for rural operations. In addition, electronic collection of data raises client confidence in MFIs, as well as reducing fraud. Finally, the system, if used by the industry as a whole, might allow MFIs to take full advantage of latent synergies that exist among geographically and financially diverse institutions.

BUSINESS MODEL

With prototype technology, the MFT implemented a pilot of the system in Uganda in partnership with three MFIs active in this country. The three MFIs were Uganda Microfinance Union (UMU), a cooperating partner of ACCION; the Foundation for International Community Assistance (FINCA), and the Foundation for Credit Community Assistance (FOCCAS), a collaborating partner of Freedom from Hunger. The difference in size and modus operandi for each MFI has allowed the MFT to assess the value of RTS against a range of practices currently in use in the microfinance industry, including group, branch, and individual clients. This assessment showed that the most commercially-oriented of the three MFIs gained the most value from the technology, in large part because they were most willing to re-engineer their business model to take advantage of the RTS. The advantages of the system as implemented included automation of transactions, reduced client time and travel, more frequent payments, reduced cash management risk, and avoidance of costs for "brick and mortar" branches.

The MFT is experimenting with improved MFI business models in Uganda. In addition, the MFT has handed over its intellectual property rights to the RTS to a new organization, Sevak Solutions, whose task will be to evolve licensing procedures and a broader business strategy for disseminating the RTS platform to microfinance institutions both in Uganda and throughout the developing world.

DEVELOPMENT BENEFIT

Because the RTS Uganda pilot was of a relatively short duration and rolled out to only hundreds of clients, it was not able to definitively prove the value of the technology at scale. Financial analysis provides evidence of benefit to loan clients, especially in rural areas that would otherwise go unserved. However, the solution was only tested with existing clients and did not include previously unserved customers. The analysis also provided evidence of high value to the agents and MFIs under some business models. Intangible benefits were also perceived, but difficult to measure. In addition, the MFT demonstrated the advantages of non-traditional partnerships among non-governmental organizations, for-

profit groups, and development agencies. If the potential for enabling remote transactions, expanding services into rural areas, and altering business practices can be achieved, then the RTS could potentially have very significant developmental impact.

WHAT WORKS: SCALING MICROFINANCE WITH THE REMOTE TRANSACTION SYSTEM

Since the early experiments of Muhammad Yunus in Bangladesh in 1976, microfinance has experienced unprecedented growth as a tool for economic development. The idea that financial services can be extended to extremely poor people, thus enabling personal development, individual sustainability and protection from exploitive informal lenders has developed into a multimillion dollar industry in the course of 30 years. Numerous organizations have been inspired by the work of the Grameen Bank and have implemented microfinance projects—from lending to savings to insurance—all over the developing world.

As of 2004, rough estimates suggest that there are between 7,000 to 10,000 microfinance institutions that serve approximately 80 million clients worldwide. Microfinance institutions often work closely with the communities they serve and thus enjoy strong ties to these communities. As a result, the industry boasts high average repayment rates[1] for their loans – so much so that some MFIs (microfinance institutions)[2] have extended their services from small loans to a full range of financial services adapted to the poor.

Moving Forward: To Profit, Scale Up

However encouraging these figures are, the microfinance industry finds itself confronted with critical issues, predominantly scale and outreach. From an estimated 500 million potential clients, only 80 million have access to the services offered by microfinance institutions. In addition, most of these 80 million customers live in urban or peri-urban areas, and the microfinance industry lacks means of reaching out to those who live in isolated rural areas. This is especially problematic in sparsely populated regions, as is the case in most African countries.

Originally viewed as a form of charity, microfinance has historically relied heavily on donor funds to sustain its operations and loan capital. Over the past decade, some players in the microfinance industry have transitioned from a donor-led model into a dynamic private sector-led business catering to the financial needs of low-income households. Though some MFIs consider their business a combination of for-profit business and development efforts, the vast majority of them still depend on donor monies. Despite the global success of the approach, donor funds have started drying up as the donor community focuses its efforts on other priorities. Such a shift is forcing the industry to rethink itself in order to turn its constituents into customers whose loans can yield a sustainable profit in the short- and long-term.

As some MFIs try to become formal members of the financial industry, regulators require them to become more accountable and to adapt their operations and reporting activities accordingly. In order to fulfil these new requirements and to be allowed to grow, many microfinance institutions are necessarily rethinking their operations to optimize their data flows.

Issues of scale, outreach, financial sustainability and accountability could be addressed, in part, through innovative applications of technology. However, as new technologies are developed to help lead the microfinance industry into the next stage of its growth, development of new business models will be as important as the technology itself.

Hewlett Packard has long been a leader in terms of understanding low-income markets as a business opportunity rather than an untouchable market. The company is actively involved in identifying ways in which its services and products can accelerate economic development in these markets. As part of its

[1] Repayment rates vary between MFIs (microfinance institutions), but nearly all MFIs enjoy repayment rates between 90 and 100 percent. Source: http://www.mixmarket.org

[2] The glossary contains explanations of this abbreviation and many others used throughout the course of this paper.

ongoing engagement with low-income markets, HP convened the Microdevelopment Finance Team (MFT) in August 2002. The MFT set out to identify technology's role in helping microfinance institutions scale up and comply with formal financial regulation.

THE MICRODEVELOPMENT FINANCE TEAM

Members of the MFT included technical experts, business strategists and microfinance leaders drawn from public and private organizations.

Drawing on the lessons learned by the founders of *VISA*[3], the MFT first established the principles under which it would operate. In their original problem statement, the MFI defined a challenge faced by microfinance as:

"Insufficient infrastructure and a lack of client reach in both delivery systems and business models restrict the delivery of the cost-effective financial products and services demanded by the world's urban and rural poor."

In this same problem statement, the MFT defined its mission:

"…to champion a breakthrough in the effectiveness, relevance, and scale of financial services to the world's urban and rural poor."

MFT Founding Members

- **HACCION InternationalH**
- **HFINCA InternationalH**
- **HFreedom from HungerH**
- **HPride AfricaH**
- **HeChangeH**
- **Bizcredit**
- **HGrameen Technology CenterH**

Solution Statements and Action Levers

The MFT laid out a four-point plan to achieve its mission:

1. Foster collaboration on central issues while allowing innovation and competition at the local level
2. Support the development of standards and procedural protocols to aggregate client data and increase information flow
3. Empower service providers at all levels of the global financial system by connecting clients and financial providers directly to financial flows from both formal and informal sources
4. Foster and enable innovative solutions that will reduce the transaction cost, increase the points of access, and broaden the range of financial products and services for the world's poor.

The MFT identified four specific levers with which to address the issue of scale. Using technology to impact these levers formed the basis of the MFT's primary objectives.

A. Lower operating costs by reducing transaction costs across core MFI processes
B. Lower financial costs by improving performance transparency and reporting standards
C. Increase capital flows by attracting commercial sources of funding to the sector
D. Improve industry dynamics by creating a framework and means of cooperation among MFIs.

HP used its brand recognition and influence to assemble a group of thought leaders who normally wound not be motivated to work together. Although the assembly of the MFT was sometimes ad-hoc and opportunistic, HP maintained throughout that an innovative solution would only succeed with input from as many stakeholders as possible. Interviews with MFT leaders from HP, MFI leaders involved with the project, and an executive from USAID responsible for the funding of the pilot revealed that the

[3] Hock, Dee W. Birth of the Chaordic Age. San Francisco: Berrett-Koehler, 1999.

motivations of individual MFT members for participating ranged from an expectation of gaining financial or technical assistance to concerns that by not being involved in the MFT, members might be missing out on a potential competitive advantage.

As time went by, participants quickly realized that collaboration with HP brought them huge value in terms of credibility, recognition and knowledge. USAID also recognizes that by combining private sector technology and management expertise with leading analysis capacity and public sector funding, the MFT was able to propose a much higher quality solution than is typical for donor-funded activities.

Janine Firpo, a director at HP and the initiative leader, estimates that HP received almost four dollars worth of value for every dollar invested in the project. These benefits have accrued in the form of financial contributions from USAID, but more importantly in the form of in-kind contributions from members of the MFT, a leading management consulting firm, top academic institutions, and other individuals who volunteered their time to the initiative. Members of the MFT committed a significant amount of time to the development of the RTS concept. The leading consulting firm, which chooses to remain anonymous, committed an entire project team to the analysis of the microfinance market in Uganda. Students from Stanford University developed a financial model to evaluate the impact of the RTS on the profitability of each MFI involved in the pilot project.

MFT Funding as of May 2003

- HP gave $250,000 in direct financial contributions to the MFT.
- HP provided a senior HP manager to lead the MFT on a full-time basis.
- Management consultants gave $900,000 in pro bono work.
- MFT members gave $148,200 through in-kind contributions.

Regular meetings of the MFT core team, in which each member organization was represented, allowed the group to uncover the most urgent issues faced by the microfinance industry. The MFT developed a technology-based solution designed to address a variety of these issues, which also has the potential to scale throughout the industry. The solution was developed by Cyndeo LLC, a software company that saw the potential of RTS as a commercial product and contributed important resources to the project.

Proposed Solution: The Remote Transaction System

In order to achieve scale and impact, RTS technology needed to lower costs, increase capital flows, and enable cooperation—in essence, achieve each of the four levers noted previously. Such a lofty goal required an electronic system that emphasized efficiency and built connections between financial systems and participants. A "data processing backbone" is the central element of the RTS solution. The backbone is composed of three modules.

- **Module 1**: Front-end processes. Module 1 is focused on inefficiencies at the client interface such as cash disbursements/collections and in-field capture of client data. In most microfinance institutions, these activities are paper-based and subject to human error, leading to inaccuracies that increase dramatically with scale.
- **Module 2**: Branch and home office back-end services. Module 2 is the MFI's MIS system. A system that automatically pulls data from the customer right through to the MFI's accounting and general ledger systems is more accurate than the status quo.
- **Module 3**: Standardized reporting and information sharing. The third module is software that links the data flowing into the MFI's MIS to other financial systems, such as central switches, banks, credit reference bureaus, and ultimately the capital markets.

Since the most critical piece of the entire backbone centers around electronic client data collection, the MFT focused first on building Module 1 and the connection to MIS systems (Module 2). These building blocks were developed over the course of the pilot and are now fully operational. However, the RTS was built with an eye toward Module 3. The MFT envisaged a system whereby MFI clients could access financial services from anywhere in Uganda, then connect to a data management system through which information from the client level could be moved to microfinance institutions and other industry stakeholders interested in institutional and client-level data for credit bureau management and commercial investment.

THE PILOT

By May 2003, the MFT was ready to field-test a prototype *Remote Transaction System* (RTS) that implemented front end (Module 1) and sufficient back end (Module 2) processes. The team then set out to raise the additional funding necessary to develop the solution further and pilot it in the field.

Pilot Location Selection

Uganda was selected as the most suitable location for the pilot due to the dynamics in the Uganda microfinance industry, the presence of active partners of MFT members in the country, and the strong national GSM network coverage. In addition, Uganda's large rural population and low population density provided a challenging environment in which to test the solution. Although it was not the most difficult geographically, MFT members agreed that if the solution could work in Uganda, then it would have a high likelihood of working in other markets as well.

Uganda MF Facts

- **Population:** 26.5 M
- **Per Capita GDP:** $1400
- **Below Poverty Line:** 35%
- **# MFIs:** 1400
- **Loan Portfolio:** US$ 53.3 M
- **Total Borrowers:** 340,000
- **Total Savers:** 900,000

Microfinance in Uganda[4]

85 percent of the Ugandan population lives in rural areas, yet it is estimated that only 10 percent of the rural population and 5 percent of the rural poor have access to financial services. This situation constrains economic growth in Uganda by limiting the rate of investment and employment creation in rural areas. Government policies attempting to catalyze market based rural financial services on a sustainable basis have been launched. The major objective of these policies is to increase rural access to financial services.

In 2003, the Government of Uganda enacted the Micro Finance Deposit Taking Institutions Act. The MDI Act (2003) is embedded within the regulatory framework of the formal financial sector and establishes the Bank of Uganda's (BOU) responsibility to license, regulate, supervise and discipline deposit taking MFIs. A major practical impact of these regulations on MFIs is that they must improve the speed and accuracy of information flow between themselves and their clients and within their organization. Two of the three microfinance institutions that the MFT selected as partners in Uganda were planning to transition to MDIs. Both of those institutions have already been given that status by the BOU.

Key MDI Act Regulations

- Establishment of minimum capital and liquidity for deposit taking and intermediation
- Specify appropriate provision for loan losses
- Lending limits for individual borrowers, shareholders and insiders to reduce the risk of bad loans
- Creation of an MDI deposit protection fund
- Corporate governance of MDIs

[4] Bank of Uganda Working Paper, *Recognizing the Role of Microfinance Institutions in Uganda*, February 2004

Pilot Funding and Duration

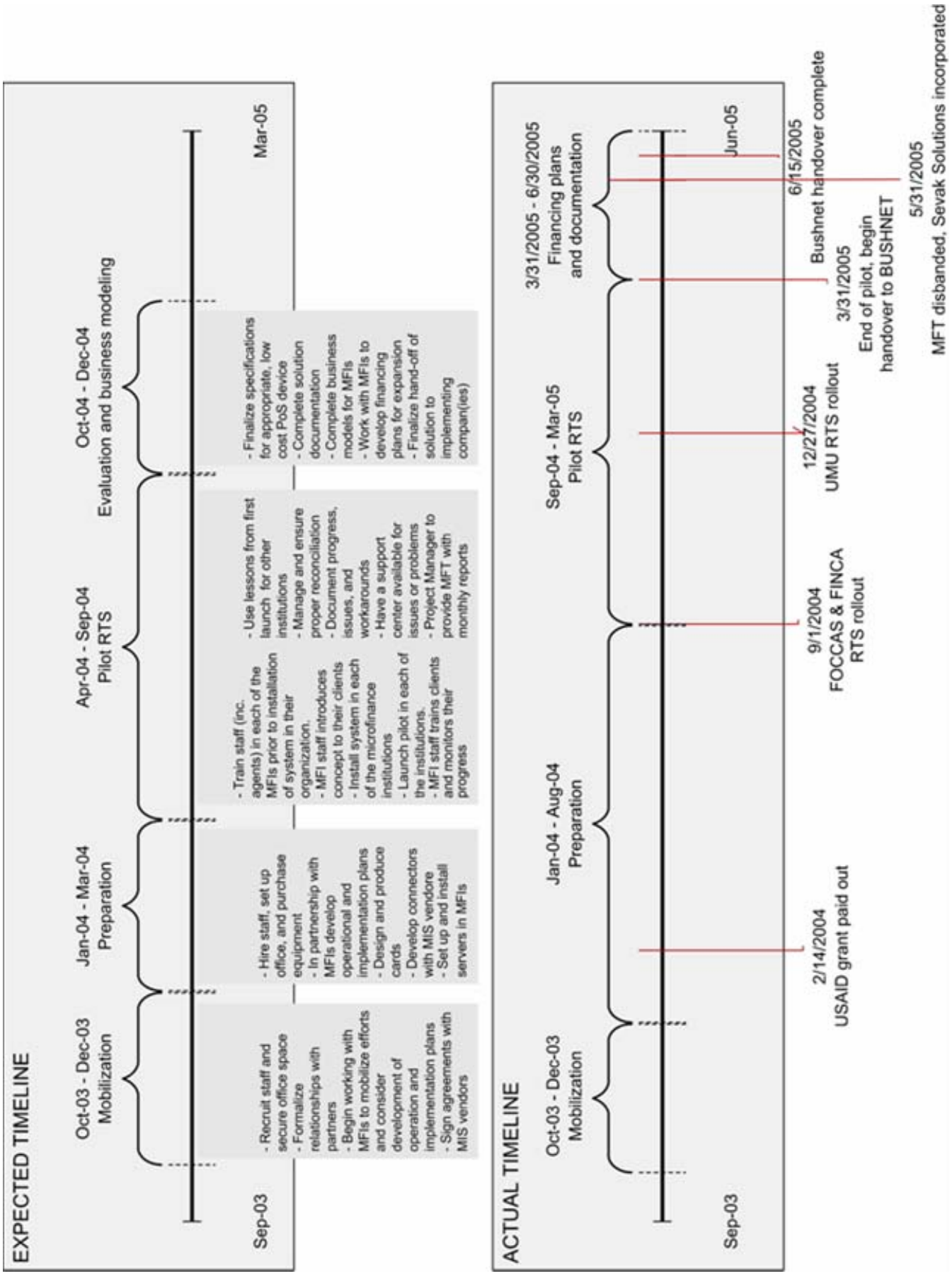
In late 2003, USAID granted US$1.2 million for a one-year pilot. To ensure that they utilized their time and funds as expeditiously as possible, the MFT spent three months doing preparatory work before actually launching the pilot in January 2004. A local team was hired to implement and manage the pilot in Uganda. The project was called RTS Uganda. The expected and actual timelines for the project are detailed in Figure 1. When compared to the actual project timeline it is clear that even with the 3 months of pre-work, the one-year timeline proved to be overly ambitious. Technical and management challenges during the summer months resulted in a three-month extension. The pilot officially ended on March 31, 2005. Some members of the MFT are continuing to work with two of the microfinance partners to help them take the solution to the next stage, and ultimately to scale within their organizations.

Three Ugandan MFIs agreed to participate in the pilot. The impact of the RTS on their business models is examined later in the paper.

- **Uganda Microfinance Union** (UMU), a partner of ACCION International; a young microfinance institution founded in 1997 and offering loans in the range of $25 to $25,000 to clients throughout Uganda. Contrary to many other MFIs, UMU's founders always saw it as a commercial venture with a social purpose.
- **FINCA Uganda**, the first African program of FINCA international, opened its doors in 1992 and since then has grown to serving close to 50,000 clients with loans averaging $215. FINCA Uganda is among FINCA's first pilot transformation programs, changing its institutional status from a non-profit nongovernmental organization into a licensed, regulated financial institution.
- **FOCCAS** is Freedom from Hunger's collaborating partner in Uganda and serves approximately 15,000 rural clients through its group-lending model.

Each of these institutions used the RTS according to their business needs and under very different circumstances. Testing the solution in three different ways added to the complexity of the pilot. However, the ability to compare the outcomes of each model has provided significant insights into the MFT's original mission—to create a breakthrough in the scale of microfinance.

FIGURE 1: Pilot timelines, expected and actual


EXPECTED TIMELINE
Sep-03
Oct-03 - Dec-03
Mobilization
- Recruit staff and secure office space
- Formalize relationships with partners
- Begin working with MFIs to mobilize efforts and consider development of operation and implementation plans
- Sign agreements with MIS vendors
Jan-04 - Mar-04
Preparation
- Hire staff, set up office, and purchase equipment
- In partnership with MFIs develop operational and implementation plans
- Design and produce cards
- Develop connectors with MIS vendore
- Set up and install servers in MFIs
Apr-04 - Sep-04
Pilot RTS
- Train staff (inc. agents) in each of the MFIs prior to installation of system in their organization.
- MFI staff introduces concept to their clients
- Install system in each of the microfinance institutions
- Launch pilot in each of the institutions.
- MFI staff trains clients and monitors their progress
- Use lessons from first launch for other institutions
- Manage and ensure proper reconciliation
- Document progress, issues, and workarounds
- Have a support center available for issues or problems
- Project Manager to provide MFT with monthly reports
Oct-04 - Dec-04
Evaluation and business modeling
- Finalize specifications for appropriate, low cost PoS device
- Complete solution documentation
- Complete business models for MFIs
- Work with MFIs to develop financing plans for expansion
- Finalize hand-off of solution to implementing compan(ies)
Mar-05
ACTUAL TIMELINE
Sep-03
Oct-03 - Dec-03
Mobilization
Jan-04 - Aug-04
Preparation
2/14/2004
USAID grant paid out
9/1/2004
FOCCAS & FINCA
RTS rollout
Sep-04 - Mar-05
Pilot RTS
12/27/2004
UMU RTS rollout
3/31/2005 - 6/30/2005
Financing plans
and documentation
3/31/2005
End of pilot, begin
handover to BUSHNET
6/15/2005
Bushnet handover complete
5/31/2005
MFT disbanded, Sevak Solutions incorporated
Jun-05

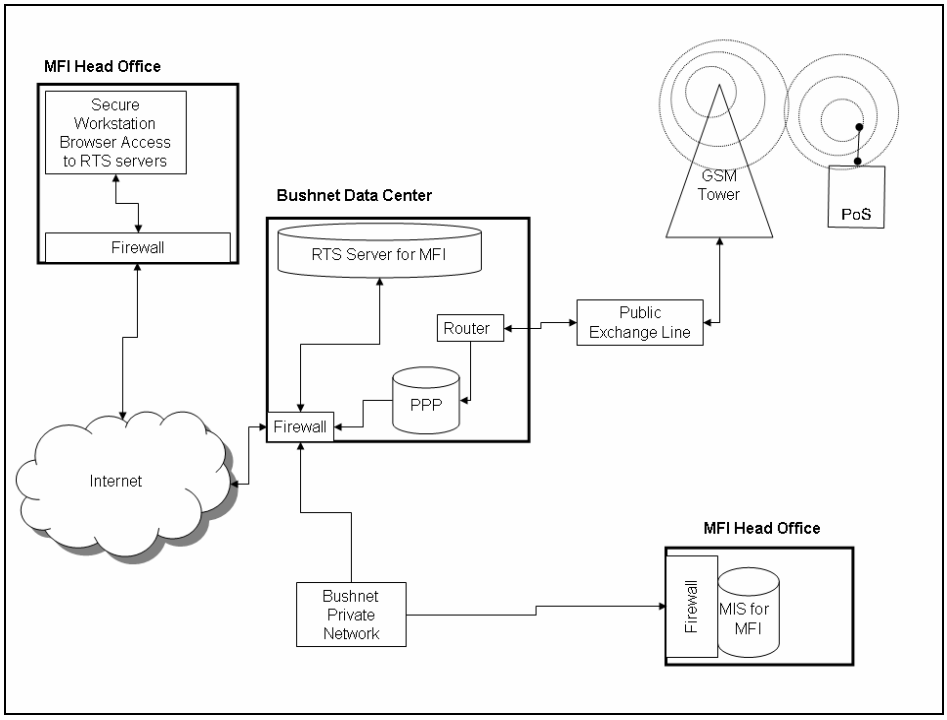
THE REMOTE TRANSACTION SYSTEM

The RTS is a combination of technology and business processes that captures the cash deposits and withdrawals of financial clients. The RTS solution consists of the following components:

- Smart cards distributed to the clients
- Wireless point-of-service terminal running the RTS client software
- Centralized server running RTS server software and an MFI connector interface
- MFI MIS environment to which transactions are reconciled

A typical server and client configuration for an MFI is detailed in Figure 2. The RTS team attempted to use existing infrastructure whenever possible. As might be expected when the team got on the ground to implement the solution, they found that some of the information they had uncovered on previous scouting missions did not actually hold true. As the team learned more about the realities of the Ugandan environment, partner microfinance institutions' business processes, and other elements that had an impact on the RTS design, the development team had to re-engineer the solution. This re-engineering was iterative and constant throughout the pilot. Two main versions of the RTS were developed over the course of the pilot, versions 1.6 and 3.3. While not significantly different in concept from version 1.6, version 3.3 takes into consideration problems met while using RTS in the field. Members of the team with experience in IT development have come to realize that the best approach to product development in these environments is an extreme programming approach rather than the more traditional methods often used in software design.

FIGURE 2: High Level Network Diagram for RTS



Hardware Components[5]

- When the RTS system was initially designed, it was fully understood that the solution would have to work in areas where there was erratic electricity, limited connectivity, potential extremes in temperature, dusty conditions, and with customers who may not have alpha literacy skills. A cost-efficient, off-the-shelf, **front-end Point-of-Sale (PoS) device**, the Lipman Nurit 8000 was chosen because it fulfilled many of the requirements.
- The RTS solution requires **smart cards**. These smart cards allow secure identification of both MFI agents and clients as well as the storage of key data, such as account numbers and account balances. The sourcing of these smart cards was problematic, as no cost-efficient provider could be found in Uganda. As a result, the team sourced the cards in India.
- Two types of cards are introduced to MFIs: client cards and agent cards. The **client card** contains client numbers, account numbers, account names, account types, and account balances. The client card is used by the client as a secure passbook. **Agent cards** are linked to specific agents and to a specific terminal. They allow agents to transact with clients using the POS device but are designed to prevent fraud on the agent's part, too.
- An RTS server that consists of a standard PC, which runs the RTS server software, handles transaction requests from PoS terminals. In addition, the RTS server software allows the RTS server to transact with the MIS software for the given MFI.

Software Components

- To be applicable "industry-wide," the **RTS server software** had to be affordable, scalable and replicable. By developing the software in accordance with the J2EE standard,[6] the solution is scaleable and can be deployed on a range of hardware and operating systems with freely available J2EE container software.
- The role of the **connector software** is to enable the RTS server software to communicate with different MIS systems. Building the connectors turned out to be more challenging than initially expected due to the challenges in communication between the MIS vendors, the RTS team and each MFI, and a limited desire among the MIS vendors to coalesce around a common connector. As a result, most of the development work was relegated to the RTS development team, which was forced to build three versions of the connector, one for each MIS. The challenges encountered when developing and managing communications flow through the connectors were major causes of delays during the pilot.
- The **PoS software** consists of a Java application developed by the RTS team which runs on top of the PoS operating system. For security reasons, each license of the PoS software will only work with a specific PoS terminal.

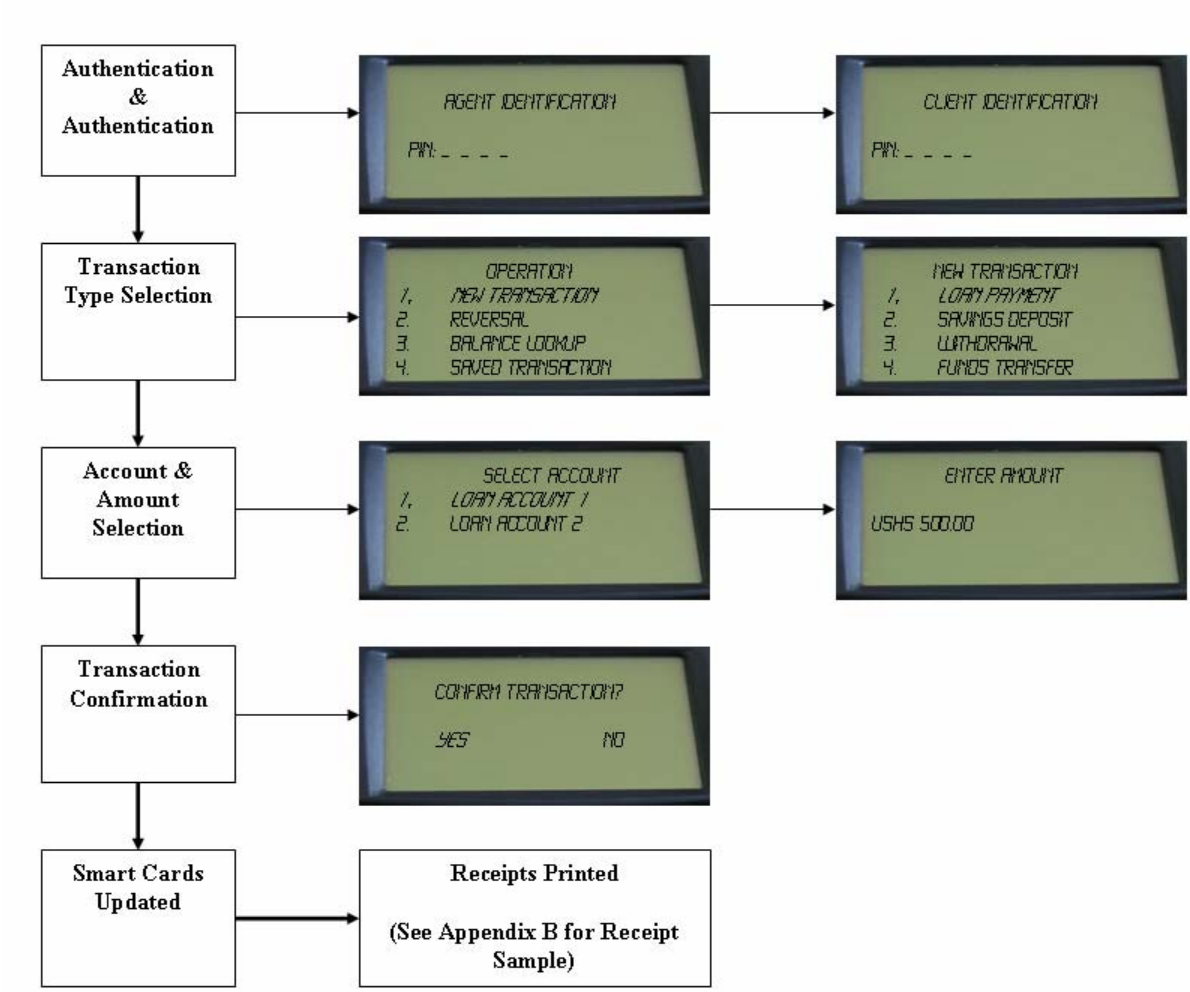
Security Components

- The data on the RTS smart cards is encrypted using public key encryption. Only the RTS development team has access to the private key, which the server uses to decrypt information.
- Clients are authenticated by their Personal Identification Number (PIN). In an online mode, client authorization takes place on the server. In an offline mode, having daily uploads mitigates authorization breaches and transaction limits on the smart cards.

[5] See Appendix A for detailed information regarding the RTS' hardware and software components
[6] Java 2 Platform, Enterprise Edition (J2EE) defines the standard for developing component-based multi-tier enterprise applications. Available: http://java.sun.com/j2ee/index.jsp

- Data travels between PoS and server over a combination of GSM network, public telephone lines and Bushnet private networks. The data is encrypted using Secure Socket Layer (SSL) 128-bit technology.
- RTS Server accounts are password protected. Data between the RTS server and MIS systems is encrypted using SSL 128-bit technology.
- RTS Servers are located in a Demilitarized Zone (DMZ) at the Bushnet server center. Port access is restricted.
- The connector between the RTS server and MIS is encrypted so as to prevent unauthorized postings of transactions to the MIS Server.
- Transactions between POS and RTS servers are uniquely identified so that a transaction can only be processed once.

FIGURE 3: Typical PoS Screen Flow for Loan Repayment

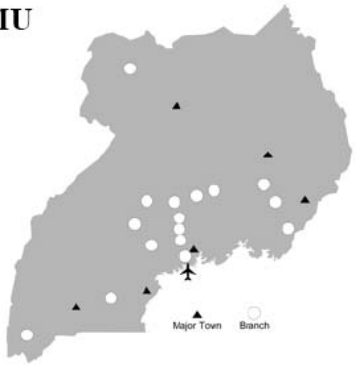


THE PARTICIPATING MFIs

Uganda Microfinance Union

Uganda Microfinance Union (UMU) is a privately owned non-governmental organization (NGO), founded in 1997, which aims to empower low-income entrepreneurs and individuals through the provision of financial services to rural communities. UMU is an ACCION partner, and their ultimate goal is for clients to migrate from the informal financial sector to the semi-formal microfinance sector and finally, to the financial mainstream. At the core of UMU's lending methodology is a group collateral and incentive system that is more flexible than standard group lending, as it does not require the groups to meet. UMU's range of financial services includes loans, savings and insurance. UMU was the first Ugandan MFI to offer loans to individuals; during the RTS pilot, UMU offered its Working Capital loan and savings account products to individuals using the system.

FACTSHEET : UMU



# personnel	246
# branches	19
# borrowers	28,099
Average loan	$225
Woman borrowers	48%
# savers	47,529
Average savings	$45

Products: Loans, savings, fund transfer, insurance, training and consulting.
Main funding sources: Grants, loans

Source: The MIX Market, status: 31/12/2003

UMU was motivated to take part in the pilot because they were considering how to provide localized access to UMU financial services in rural areas while maintaining low transaction costs for their clients. UMU branches are full-service physical locations and cost, on average, US$50,000 to set up; therefore, a branch-free infrastructure to serve rural areas is a UMU priority. A secondary motivation for participation in the MFT is that easier access to UMU's services would encourage clients to increase the frequency of their savings deposits.

The UMU Model: Merchant (third-party) Agent Model

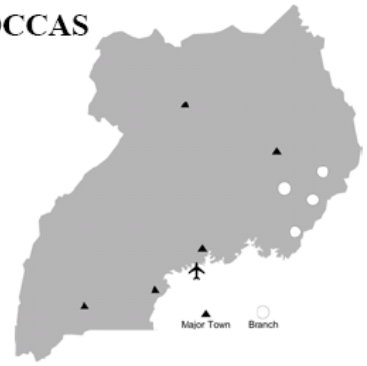
UMU chose two gas station franchisees that have consistent financial liquidity through their business operations to serve as independent, third-party agents. Clients who wish to make loan payments or deposit savings visit these UMU agents, whose businesses are located close to the clients' home and work. Financial transactions are captured by the POS, while cash is exchanged between the UMU client and UMU agent. UMU agents must already have savings accounts with UMU; funds are automatically transferred and reconciled within UMU's back-end accounting systems. The agents receive a transaction fee levied on UMU clients at the PoS. Prior to the introduction of the RTS, UMU clients traveled to the nearest UMU branch. Since the introduction of RTS, clients can travel either to their branch or to an agent, whichever is more convenient. This has resulted in benefits for clients and branches alike. Clients spend less time traveling, while the introduction of third party agents and PoS devices reduces the teller workload.

Foundation for Credit and Community Assistance

The Foundation for Credit and Community Assistance (FOCCAS) was registered as an international NGO in Uganda in 1995 and is based in Mbale in southeast Uganda. FOCCAS provides financial and educational services that respond to the basic needs of poor families in rural Uganda, the aim being to empower families with increased incomes, new business skills and improved health. To achieve these aims, FOCCAS has partnered with Freedom From Hunger (FFH) since 1993.

Services are offered through a village-banking solidarity group model. Clients are organized into solidarity groups of approximately 6 members, who appoint a group treasurer to track the group's funds. Primary responsibility for loan repayments rests with the solidarity group. Solidarity groups are joined to form a Credit Association (CA), which consists of approximately 25-35 members. Each CA then forms a Management Committee consisting of a Chairperson, Secretary and Treasurer. FOCCAS loan officers interact with clients at the CA level during weekly repayment meetings. During these meetings the loan officer captures repayment data at the group level. After the group meetings the CA leaders then travel to the bank to deposit their loan repayments.

FACTSHEET : FOCCAS



# personnel	77
# branches	4
# borrowers	16,076
Average loan	$41
Woman borrowers	100%
# savers	0
Average savings	0

Products: Credit with education, group loans, consulting.
Main funding sources: Grants, loans

Source: The MIX Market, status: 30/09/2003

FOCCAS wanted to move from capturing data at the group level to capturing data at the client level so that they could disaggregate by client activity. Prior to the creation of the RTS, FOCCAS considered employing additional full-time staff to track deposits and withdrawals manually. It needed an efficient, accurate and cost-effective way to transition to individual record keeping.

The FOCCAS Model: Field Agent Model

Field Officers take the PoS device to group meetings, where they capture individual client data about loan payments, savings transactions, and fund transfers. At the end of the meeting, the group leaders still take the accumulated cash to the bank as they always have. The Field Officer can transact with up to 5 different groups each day, keeping each group's transaction history separate on the PoS device. At the end of the day, the Field Officer uploads all the transactions on the device to FOCCAS' back-end systems where the data is logged and reconciled.

FINCA

FINCA Uganda (FU) is a privately owned non-governmental organization founded in 1992. It aims to empower Uganda's poorer communities by providing them with microfinance services. FU is one of the five African affiliates of FINCA International Inc. (FI) and lends primarily to women using the Village Banking Methodology™ developed by FINCA International. A FINCA Field Officer monitors village-banking groups on a weekly basis.

FU was the first MFI in Uganda to be awarded an MDI license. This will allow FU to lend from the deposits of its clients once its savings-to-loans ratio meets regulatory requirements. However, the MDI license commits FU to computerize and network its branches to increase the rate and quality of information flow. FINCA was motivated to join the pilot as it viewed RTS-enabled branches as a low-cost means of expanding the branch network into rural areas while being able to capture data electronically and meet their MDI commitments. FINCA did not think that an agent model would be appropriate for them for the time being because it did not accommodate the role of the field officer.

FACTSHEET : FINCA

FINCA
Small Loans-Big Changes

# personnel	214
# branches	6
# borrowers	36,912
Average loan	$76
Woman borrowers	98%
# savers	0
Average savings	0

Products: Group loans, individual loans, payroll loans, voluntary and compulsory savings, village phone loans, credit life insurance and health insurance.
Main funding sources: Grants, loans, savings

Source: The MIX Market, status: 30/06/2003

The FINCA Model: Sub-branch Model

FINCA piloted the RTS at a remote branch office with the ability to receive and dispense cash. FINCA had previously opened a sub-branch closer to some of their current clients. Tellers travel to the sub-branch twice a week, where they meet with group leaders depositing their loan payments and savings deposits. At the end of each banking day, the teller travels to the closest bank with the accumulated cash where it is deposited. She then travels back to FINCA's main branch to input data and finalize her banking day. The RTS provides a way to capture group transactions in an electronic format, simplifying the process and eliminating the need for tellers' manual data entry at the end of each day.

PILOT IMPLEMENTATION

UMU Pilot Implementation

The UMU model is based on merchant agents acting as full, bonded agents for UMU. This means that when a UMU client wishes to withdraw cash from her savings account, the UMU agent will disperse the cash from the agent's own savings account. Likewise, when a client deposits money into her savings account or makes a loan repayment, the agent will deposit the money in to his own savings account. The agent's account is then reconciled with UMU on a daily basis. The involvement of a third party intermediary adds complexity to the UMU model and required both technical and operational changes that were not necessary in the other models. The challenges resulting from this model caused delays in getting the solution into the field.

On the technology side, the software had to be able to accommodate agents who were receiving more funds from clients than expected. Additional features were added to the PoS application to enable agents to update their bank balances on an as-required basis. Furthermore, additional security features were

incorporated into the PoS to mitigate the increased risk of fraud that UMU faced. These changes included limiting the amount that a client could withdraw each day, placing a cap on the amount an agent could accept each day, and minimum savings account balances for both agents and clients.

On the operational side, contracts needed to be signed between UMU and their agents to ensure that agents understood their obligations and risks. This took more time than originally anticipated. In addition, UMU wanted to delay its RTS deployment until the implementations at the other MFIs were working first.

The desire not to be first meant that UMU's deployment was sometimes dictated by issues that were of more significance to the other MFI's. For example, the first iteration of the software was designed to work primarily in an online mode. This worked without problems for UMU, yet caused problems for the field and sub-branch models because connectivity in these locations was more erratic. It was also a significant problem for FOCCAS when 25-35 clients transacted all at once. The online mode increases the time it takes to complete a transaction because the PoS has to send a message to the RTS server, then the MIS server, and receive a response through the same pathway for each transaction. This delayed the FOCCAS group meetings and was not always a viable solution in rural areas where GSM network coverage was unreliable. It was decided that UMU too would eventually need an offline model if they were to include agents in rural locations and that it would be cheaper to do the re-engineering for all 3 models at one time. Therefore, the RTS system was reengineered to operate primarily in an offline mode. However, when this mode was introduced, it presented a new range of problems because of the range of account adjustments that were made at the MIS without corresponding updates to the clients' smart cards. In the end, the RTS team developed a solution for UMU that switched between online and offline modes depending on the reliability of the cellular connection.

The two figures below show the usage patterns for UMU before and after the introduction of the RTS. Figure 4 details the branch procedure that was in place prior to the introduction of the RTS. Figure 5 details the changes that were introduced at RTS enabled branches and the new procedures that were developed for third-party agents.

For the purposes of the pilot, UMU had planned to introduce the RTS system to between five and ten UMU agents and between 1000 and 2000 clients. After three months, two agents and 400 clients were involved in the pilot. The RTS team had overestimated the amount of time it would take to overcome technical and operational challenges. The original objectives were not achievable in the three months during which the technology was on the ground. In addition, initial client uptake was slower than expected because clients who received cards were not originally screened. A number of clients lived closer to the branch than the agents, so continued to visit their branch and did not use their smart cards. Currently there are approximately 100 active clients transacting with 2 agents located at Jinja and Bugembe. RTS Uganda is currently helping UMU to develop card disbursement procedures that will increase card uptake and provide higher levels of transacting. UMU aims to have 1500 clients using RTS nine months into the program. UMU and RTS Uganda believe these estimates to be realistic if they apply the lessons that they have learned from the pilot so far. As the pilot the implementation has progressed even beyond the official pilot, there has been increasing buy-in from management and staff. This has resulted in a better understanding of what is operationally and procedurally important at different levels within UMU. Furthermore, RTS Uganda has also gained a better understanding of what is required to design a system that will support the UMU model and scale in terms of numbers and outreach. The result is that UMU and RTS Uganda are now able to anticipate problems at an earlier stage in the development and deployment of the RTS.

FIGURE 4: UMU Branch Procedure Prior to RTS

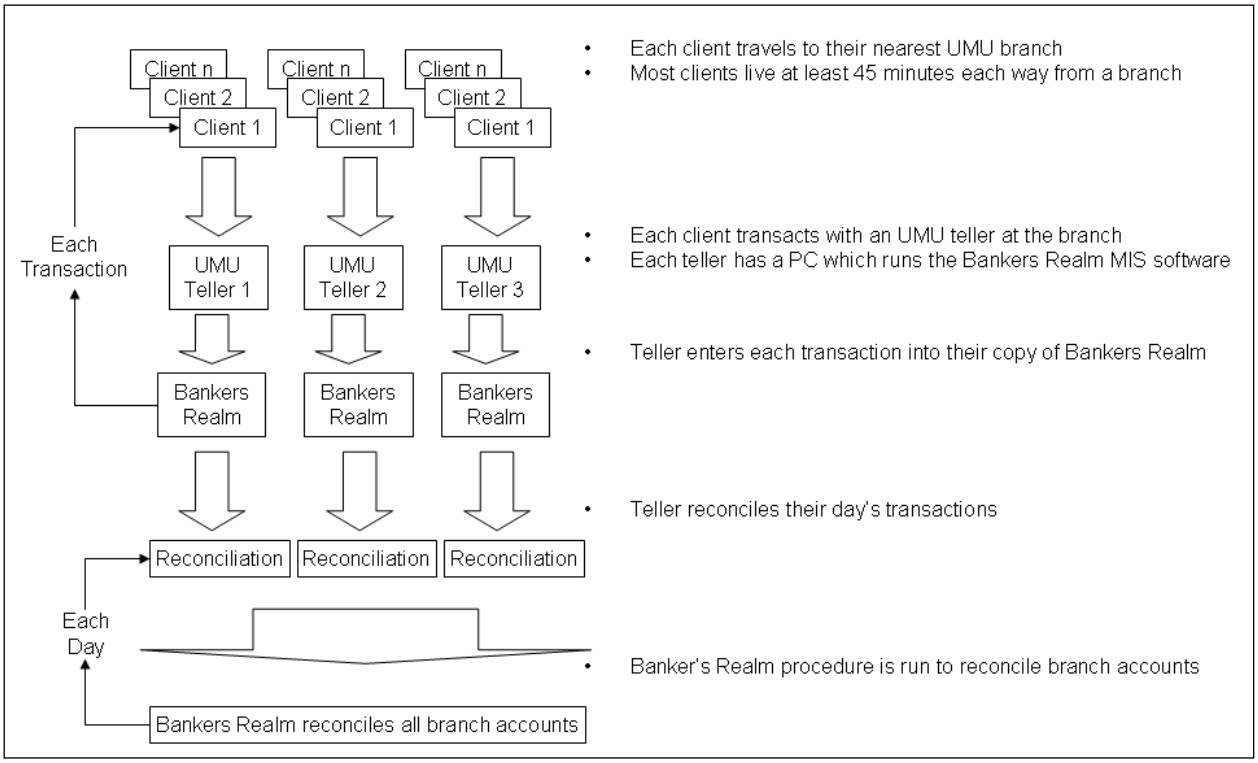
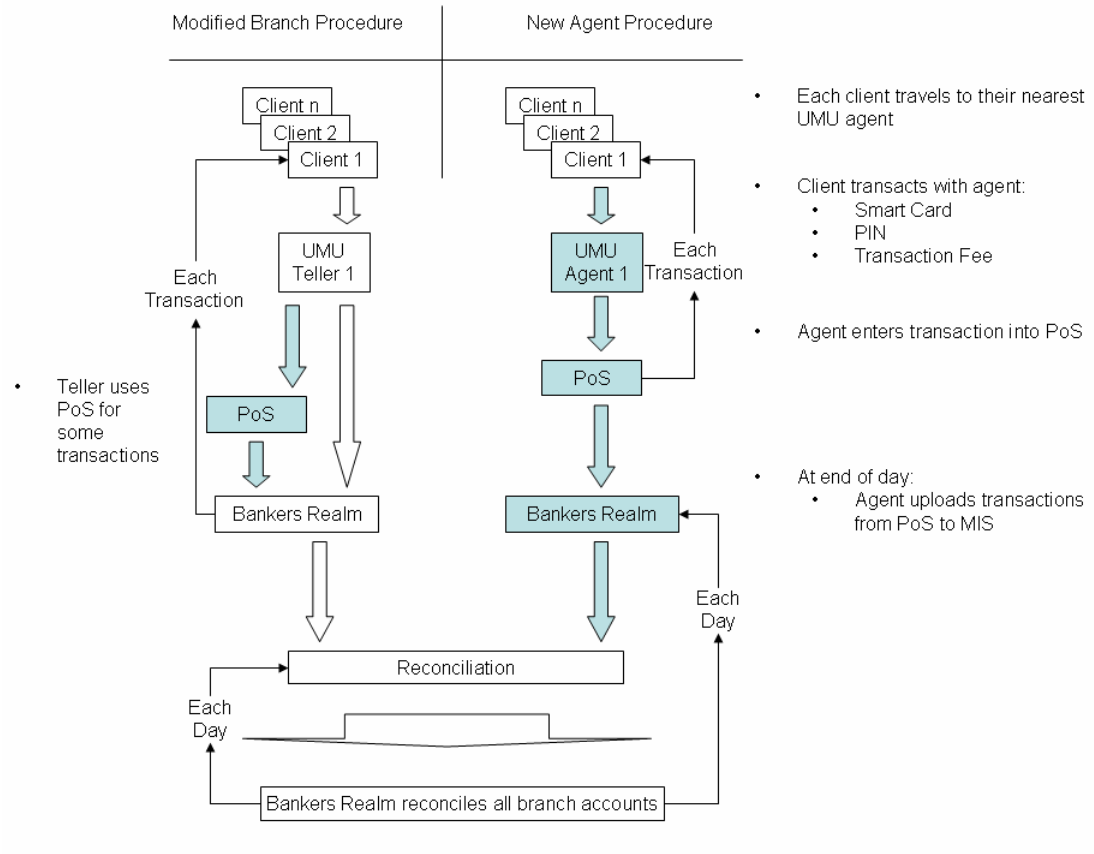

Client n
Client 2
Client 1
Each Transaction
UMU Teller 1
UMU Teller 2
UMU Teller 3
Bankers Realm
Reconciliation
Each Day
Bankers Realm reconciles all branch accounts
• Each client travels to their nearest UMU branch
• Most clients live at least 45 minutes each way from a branch
• Each client transacts with an UMU teller at the branch
• Each teller has a PC which runs the Bankers Realm MIS software
• Teller enters each transaction into their copy of Bankers Realm
• Teller reconciles their day's transactions
• Banker's Realm procedure is run to reconcile branch accounts

FIGURE 5: UMU Branch and Agent Procedures with RTS



Client and agent response has been extremely positive and UMU has had to increase the limits on how much cash agents are able to collect each day. Our interview with the UMU agent at Jinja indicated that they found the PoS device easy to use and welcomed the transaction fees as a new revenue stream. In addition she recognized the potential for increased sales of traditional goods being generated from the increased customer flow to her premises. This ancillary impact has not yet been quantified and is not included in Table 1 which details the financial impact of the RTS on third party agents. Further details on this impact can be found on the complete RTS Financial Analysis available on the website of Sevak Solutions (www.sevaksolutions.org).

TABLE 1: Financial Impact on 3rd Party Agent

Expenses	**Telecom and Labor ($)**
• Per client annual	(6.70)
• Per 400 3rd Pty Agent client base annual	(2,670)
Revenues	**Agent Fees ($)**
• Per client annual	13.40
• Per 400 3rd Pty Agent client base annual	5,350[7]
Gross Margin	**2,680[8]**

[7] Does not include potential for increased sales of agent's goods due to increased client flow through agent premises.
[8] Represents a 4% to 12% increase in gross margin for the agent

Clients appreciate the savings they make from not having to travel all the way to a UMU branch. The financial benefits to clients are detailed in Table 2. By having agents that are close by, clients can transact more frequently, which reduces the security risk of traveling with large amounts of cash and reduces client account leakage.

TABLE 2: Financial Impact on Existing Client

Impact on frequency of local financial transactions	**Positive**
• Reduce leakage by 5%	$229
• Reduce Travel and Incidental costs	$124
• Value of client's travel time saved	$112
• Reduce cost of proxy payment services	$12
• Client transaction fees for RTS Agent	($23)
Reduce time in group meetings	No Change
• Value of client's meeting time saved	
Convert from group to individual record keeping	No Change
• Establish individual credit history	
Existing Client Savings from RTS	**$442**

The financial impacts on client and agent have been based on a volume of 400 clients per agent and each client paying a fee of 1000 UGX (US$0.58) per transaction with 600 going to the agent and 400 going to the MFI. Table 3 uses these figures and the costs measured during the pilot to calculate a break even volume of clients at which UMU's operating revenues match its operating expenses. UMU would need 2630 clients to break even; this represents just under 10% of their current client base and could be served by 5 agents, which indicates that the RTS would be sustainable even when deployed to a small number of clients.

TABLE 3: Impact on Operating Income

Deployment Size	**Breakeven**
Revenue – (From transaction fees and process savings)	
• Client annual fee received	$23,410 [$8.90/client][9]
• MFI processing savings (reduced work volume)	$1,220 [~$0.47/client]
Expense - RTS related annual costs	
• Field RTS PoS trans airtime	$0 (Agent Pays)
• Field RTS PoS trans paper	$0 (Agent Pays)
RTS Annual operating costs	
• HQ RTS IT Sr. staff ops & support @ $700	($8,400)
• HQ RTS Training staff @ $500	($6,000)
• HQ RTS vol. IT Jr. staff ops & support @ $500	($0)
• RTSE MFI monthly support fee @$850/mo	($10,200)
Total annual HQ operating expense	**($24,600)**
RTS Operating Income	
• Operating revenue	$23,410
• Field operating savings from using RTS	$1,220
• Field operating expense for using RTS	($0)
• HQ operating savings from RTS	($0)
• HQ operating expense for RTS	($24,600)
Operating income at indicated volume	**$20**
Required client vol. to achieve breakeven	**2,630 clients**

Table 4 details the operating income generated from a deployment of the RTS to all UMU clients. Even when both start-up and depreciation costs are added (Table 5), the RTS generates a positive annual return of $171,160.

[9] Client paid agent fee based upon 1,000 Uganda shilling fee ($0.58) per payment transaction split 60% for agent and 40% for MFI (See text for discussion about multiple transaction charging models)

TABLE 4: Impact on Operating Income with Full Deployment

Deployment Size	**UMU Wide**
Revenue – (From transaction fees and process savings)	
• Client annual fee received	$318,500 [$8.90/client][10]
• MFI processing savings (reduced work volume)	$16,600
Expense - RTS related annual costs	
• Field RTS PoS trans airtime	($0) agent pays
• Field RTS PoS trans paper	($0)agent pays
RTS Annual operating costs	
• HQ RTS IT Sr. staff ops & support @ $700	($8,400)
• HQ RTS Training staff @ $500	($6,000)
• HQ RTS vol. IT Jr. staff ops & support @ $500	($18,000)
• RTSE MFI monthly support fee @$850/mo	($10,200)
Total annual HQ operating expense	**($42,600)**
RTS Operating Income Analysis for MFI (funded via grant)	
• Operating revenue	$318,500
• Field operating savings from using RTS	$16,600
• Field operating expense for using RTS	($0)
• HQ operating savings from RTS	($0)
• HQ operating expense for RTS	($42,600)
• Annual RTS basic start-up costs	($50,400)
• Annual depreciation expense (3 yr straight line)	($71,940)
Operating income at indicated volume	**$170,160**

[10] Client paid agent fee based upon 1,000 Uganda shilling fee ($0.58) per payment transaction split 60% for agent and 40% for MFI (See text for discussion about multiple transaction charging models)

TABLE 5: Total Start Up Costs for Breakeven and UMU Wide Deployments

Deployment Size	**Breakeven**	**UMU Wide**[11]
RTS Capital costs (total costs):		
• MIS Connector to RTS server system	($4,800)	($4,800)
• Computers @ $1,500 each (PCs to start)	($4,500)	($4,500)
• Computers @ $1,500 each (add'l volume)	($0)	($33,000)
• Communication link install @50%	($875)	($17,500)
• HQ PoS devices for RTS support staff @ $700	($700)	($2,800)
• LO/Agent/Branch RTS PoS devices @ $700	($5,600)	($63,700)
• Client smart cards 16,432 / 21 / 2,235 @ $2.50	($6,630)	($89,520)
Total Capital Expense	**($23,110)**	**($215,820)**
Total annual depreciation exp (3 yr amortization)	**($6,680)**	**($71,940)**
(Grant Funded) Start-up Costs for MFI		
• Project Manager 2 yrs @ $1,200/mo	$28,800	$28,800
• Start-up trainer & cust. support 2 yrs @$500/mo	$12,000	$12,000
• Product customization	$10,000	$10,000
• External start-up project & management consult	$50,000	$50,000
Total Start-up Costs	**$100,800**	**$100,800**
Total Capital Cost	**$23,110**	**$215,820**
Total Start-up Costs	**$100,800**	**$100,800**
Total Start-up and Capital Costs	**$123,910**	**$316,620**

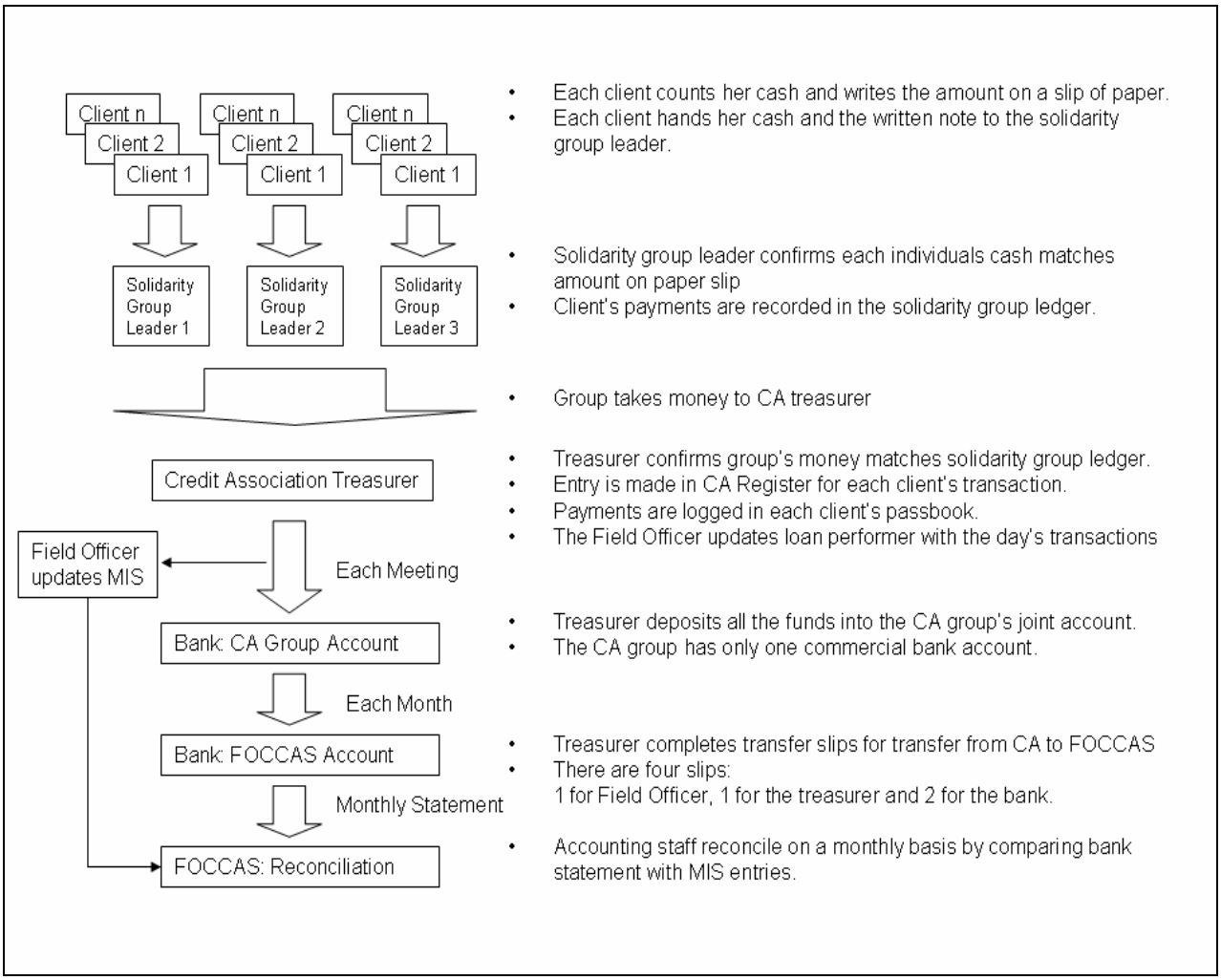
[11] UMU could deploy the RTS to all 35,787 UMU clients by RTS-enabling 20 branches and 90 agents.

FOCCAS Pilot Implementation

FOCCAS planned to introduce RTS to half of the field officers based at the Mbale office, which would have resulted in approximately ten field officers and 2500 clients being involved in the pilot. However, this target proved too ambitious, and by the end of the pilot PoS devices had been issued to two field officers working with seven groups and approximately 220 clients. The low numbers were due in part to problems in transferring knowledge between the RTS team's Customer Service Officers (CSOs) and the Field Officers. The first problem was that Field Officers would be transferred to different groups before they were fully trained in the use of the PoS. The second problem was that each group had its own procedural idiosyncrasies for handling certain group events (such as over- or under-payment by a group member); this made it difficult for CSOs to develop a uniform procedure for all field officers to follow. The FOCCAS board, staff, and management viewed the pilot positively, yet no manager was identified nor empowered to take responsibility for and resolve RTS-related issues arising from the implementation of the pilot. As a result, there was little consensus at the operational level as to what changes should be implemented by the development team to make the RTS more valuable to FOCCAS. This type of problem was not particular to FOCCAS and it was one of many challenges facing MFIs that wanted to roll out the RTS on a fixed, aggressive schedule.

FOCCAS' main lending product combines credit with education; each group meeting is supposed to start with the field officer delivering a 45 minute educational message on health care or business development. The financial group meeting follows the educational message. Prior to the introduction of RTS, the financial group meeting proceeded as detailed in Figure 6. The group meeting was characterized by a repetitive cycle of handling, counting and recording money. Most clients brought payments in small bills and coins which meant that mistakes were often made when counting the money. In such cases, the whole cycle had to begin again and it was difficult to quickly identify where the mistake had occurred. Furthermore, FOCCAS was able to reconcile their accounts only upon receipt of their monthly bank statements. This made management of the business very challenging, as the information necessary to make daily operating decisions was often not available or based on non-reconciled information. Figure 7 details the impact that the PoS had on the group meeting procedures.

FIGURE 4: FOCCAS Group Meeting Procedure Prior to Introduction of RTS

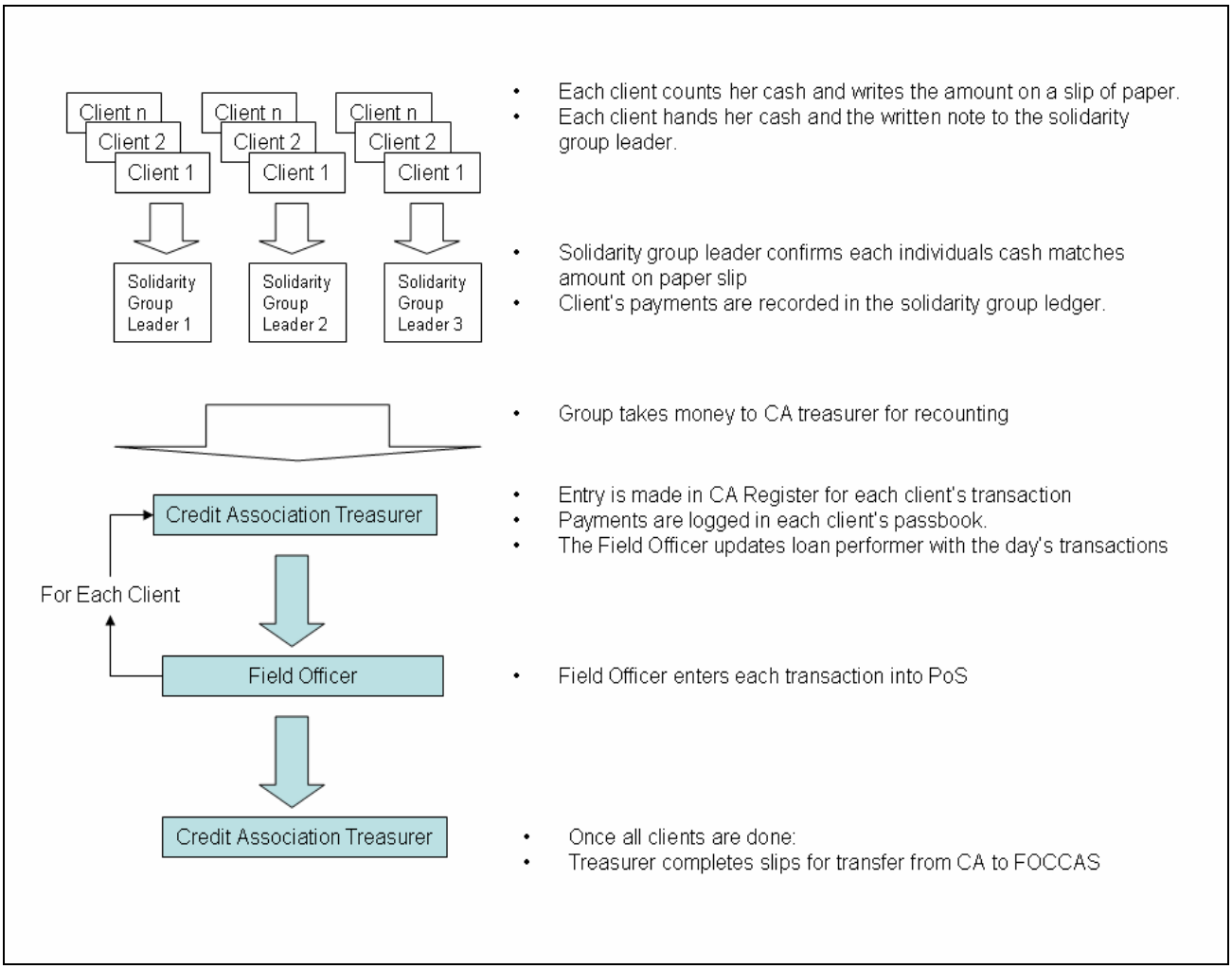

Client n
Client 2
Client 1
Client n
Client 2
Client 1
Client n
Client 2
Client 1
Solidarity Group Leader 1
Solidarity Group Leader 2
Solidarity Group Leader 3
Credit Association Treasurer
Field Officer updates MIS
Each Meeting
Bank: CA Group Account
Each Month
Bank: FOCCAS Account
Monthly Statement
FOCCAS: Reconciliation
• Each client counts her cash and writes the amount on a slip of paper.
• Each client hands her cash and the written note to the solidarity group leader.
• Solidarity group leader confirms each individuals cash matches amount on paper slip
• Client's payments are recorded in the solidarity group ledger.
• Group takes money to CA treasurer
• Treasurer confirms group's money matches solidarity group ledger.
• Entry is made in CA Register for each client's transaction.
• Payments are logged in each client's passbook.
• The Field Officer updates loan performer with the day's transactions
• Treasurer deposits all the funds into the CA group's joint account.
• The CA group has only one commercial bank account.
• Treasurer completes transfer slips for transfer from CA to FOCCAS
• There are four slips:
1 for Field Officer, 1 for the treasurer and 2 for the bank.
• Accounting staff reconcile on a monthly basis by comparing bank statement with MIS entries.

It should be noted that when the PoS was first introduced to the group meetings in September 2004, it actually worsened group dynamics by slowing the group meetings without introducing any benefits. After the women had completed all their previous counting and recording procedures, they turned to the RTS to capture their transactions electronically. The RTS was working in an online mode and taking approximately 90 seconds to complete each transaction, adding unacceptable delays to the process. The RTS team quickly realized that this was not a viable solution and began working more closely with FOCCAS to understand every element of their group and reconciliation processes. As a result of direct and continual consultation with FOCCAS, the following changes were made to the end-to-end process:

- The Field Officer no longer waits for the Treasurer to complete all client transactions. The Field Officer now enters each client transaction as soon as it is confirmed by the treasurer and gives the client her receipts.
- Once all the clients have been processed by the treasurer and the Field Officer, the Field Officer produces a PoS Summary Report as depicted in Appendix B.

- A Quick Reconciliation form[12] was introduced to identify quickly any discrepancies between the amounts recorded and the amounts collected. If the amounts do not tally, then the treasurer and the Field Officer can track the error by comparing the CA Register entries to the receipts generated by the PoS device.

FIGURE 5: FOCCAS Group Meeting Procedure Following Introduction of RTS


Client n
Client 2
Client 1
Solidarity Group Leader 1
Solidarity Group Leader 2
Solidarity Group Leader 3
Credit Association Treasurer
For Each Client
Field Officer
Credit Association Treasurer
• Each client counts her cash and writes the amount on a slip of paper.
• Each client hands her cash and the written note to the solidarity group leader.
• Solidarity group leader confirms each individuals cash matches amount on paper slip
• Client's payments are recorded in the solidarity group ledger.
• Group takes money to CA treasurer for recounting
• Entry is made in CA Register for each client's transaction
• Payments are logged in each client's passbook.
• The Field Officer updates loan performer with the day's transactions
• Field Officer enters each transaction into PoS
• Once all clients are done:
• Treasurer completes slips for transfer from CA to FOCCAS

The effect of these changes was to reduce money-handling errors, streamline the meeting process and enable more frequent reconciliation for FOCCAS.

Historically, each group paid an additional 2% of their loan into a fund to cover expenses that the group might incur. This charge was viewed as an additional MFI interest charge by group members and provided opportunities for misuse by group members since it was not effectively tracked in FOCCAS' MIS. Use of the RTS to track individual client payments eliminated this charge thereby reducing client costs and improving FOCCAS' visibility into loan performance.

Despite the improvements in the group meeting process and the possibility for increased frequency of reconciliation, RTS Uganda felt that FOCCAS was not taking sufficient advantage of the RTS system

[12] See Appendix B for sample

with regard to account reconciliation, transparency at an individual client level, and commingling of savings deposits and loan payments. By using the PoS to track repayment information at an individual level, but then continuing to reconcile on a group basis, FOCCAS would not achieve their goal of increased transparency at an individual level. By relying on monthly bank statements to reconcile accounts and not tracking loan fees separately, it was impossible for FOCCAS to provide their clients with up–to-date information at group meetings. It was the opinion of RTS Uganda that investment in the RTS would not be justified without changes in these aspects of FOCCAS' operations.

In February 2005, following recommendations from RTS Uganda, FOCCAS hired a business process consultant to establish new group and reconciliation processes and take advantage of the PoS and RTS. As of the writing of this case, the work is not complete and RTS Uganda is working in conjunction with Freedom From Hunger to present the business and financial case for continuing with the reengineering to the FOCCAS board. Table 6 indicates that the only financial impacts on the client are the removal of the 2% charge and the savings from spending less time in meetings. Other intangible benefits, such as increased transparency, are not included in these quantitative calculations.

TABLE 6: Financial Impact on Existing Clients

Impact on frequency of local financial transactions	**No Change**
• Reduce leakage by 5%	0
• Reduce Travel and Incidental costs	0
• Value of client's travel time saved	0
• Reduce cost of proxy payment services	0
• Client transaction fees for RTS Agent	0
Reduce time in group meetings	**No Change**
• Value of client's meeting time saved	$62
Convert from group to individual record keeping	**Converting**
• Eliminate 2%/month loan surcharge[13]	$17
• Establish individual credit history	Client Impact Not Quantified
Existing Client Savings from RTS	**$79**

Table 7 indicates that use of the RTS does not have a financial impact on the Field Officer, which is due to the fact that the Field Officer is a salaried employee. However the improved efficiency of operation should allow the Field Officer to meet other sales targets more easily.

TABLE 7: Financial Impact on Loan Officer

Impact on frequency of local financial transactions	**No Change**
Impact on Expenses for Field Officer	**None**
• Per client annual	$0
Impact on Revenues for Field Officer	**None**
• Per client annual	$0
Gross Margin	**No Change**

FOCCAS' primary motivation for piloting the RTS was as an automated alternative to manual implementation of individual loan tracking. FOCCAS does not generate any additional revenue from its

clients' use of the RTS and pays for PoS consumables and airtime charges from its existing revenue stream. These additional expenses must be compared with the estimated cost of the paper-based manual process FOCCAS had originally considered. Table 8 indicates that if FOCCAS were to attempt individual loan tracking with all their clients, then the RTS would be more economical than a manual implementation.

TABLE 8: Impact on Operating Income

Deployment Size	**Breakeven**[14]
Additional Revenue	
• Client annual fee received	$0
• MFI processing savings (reduced work volume)	$46,580
Expense - RTS related annual costs	
• Field RTS PoS trans airtime	($13,040)
• Field RTS PoS trans paper	($1,860)
RTS Annual operating costs	
• HQ RTS IT Sr. staff ops & support @ $700	($8,400)
• HQ RTS Training staff @ $500	($6,000)
• HQ RTS vol. IT Jr. staff ops & support @ $500	($6,000)
• RTSE MFI monthly support fee @$850/mo	($10,200)
Total annual HQ operating expense	**($30,600)**
RTS Operating Income	
• Operating revenue	
• Field operating savings from using RTS	$46,580
• Field operating expense for using RTS	($14,900)
• HQ operating savings from RTS	($0)
• HQ operating expense for RTS	($30,600)
Operating income at indicated volume	**$1,080**
Required client vol. to achieve breakeven	**16,412 clients**

Because FOCCAS only breaks even when the RTS is deployed to the whole organization, there is no opportunity to make significant inroads into the capital or start-up costs of the RTS. These costs are detailed in Table 9 and would have to be entirely grant-funded unless FOCCAS can generate further savings or increased revenue from its use of the RTS. Such gains could be made if FOCCAS is able to leverage the individual data collected by the RTS. For example, if FOCCAS is able to assess quickly an individual borrower's performance within a group then the quality of the FOCCAS loan portfolio will improve as the accuracy of the risk assessment of their portfolio increases.

[14] To break even, FOCCAS would have to deploy to all 16,412 clients and RTS enable 4 branches with 27 loan officers.

TABLE 9: Total Start-Up Costs

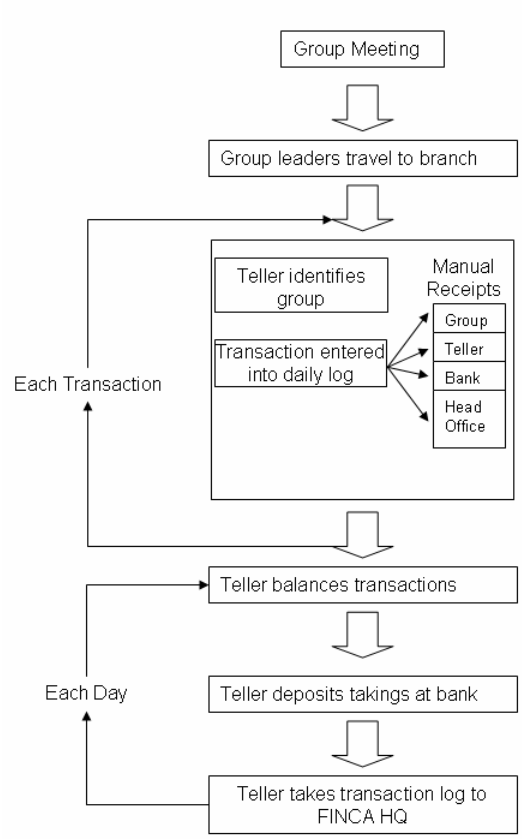
Deployment Size	**Breakeven**
RTS Capital costs (total costs):	
• MIS Connector to RTS server system	($6,000)
• Computers @ $1,500 each (PCs to start)	($4,500)
• Computers @ $1,500 each (add'l volume)	($4,500)
• Communication link install @50%	($3,500)
• HQ PoS devices for RTS support staff @ $700	($1,400)
• LO/Agent/Branch RTS PoS devices @ $700	(9,600)
• Client smart cards 16,432 / 21 / 2,235 @ $2.50	($41,080)
Total Capital Expense	**($80,580)**
Total annual depreciation exp (3 yr amortization)	**($26,860)**
(Grant Funded) Start-up Costs for MFI	
• RTS capital costs	$80,580
• Project Manager 2 yrs @ $1,200/mo	$28,800
• Start-up trainer & cust. support 2 yrs @$500/mo	$12,000
• Product customization	$10,000
• External start-up project & management consult	$50,000
Total Start-up Costs	**$181,380**

FINCA Pilot Implementation

Of the three pilot implementations, the FINCA pilot has created the least value with respect to the MFI and its clients. As such, the benefits of the system did not offset the cost of maintaining the RTS and this is confirmed in Table 12, which details the impact of the RTS on operating income.

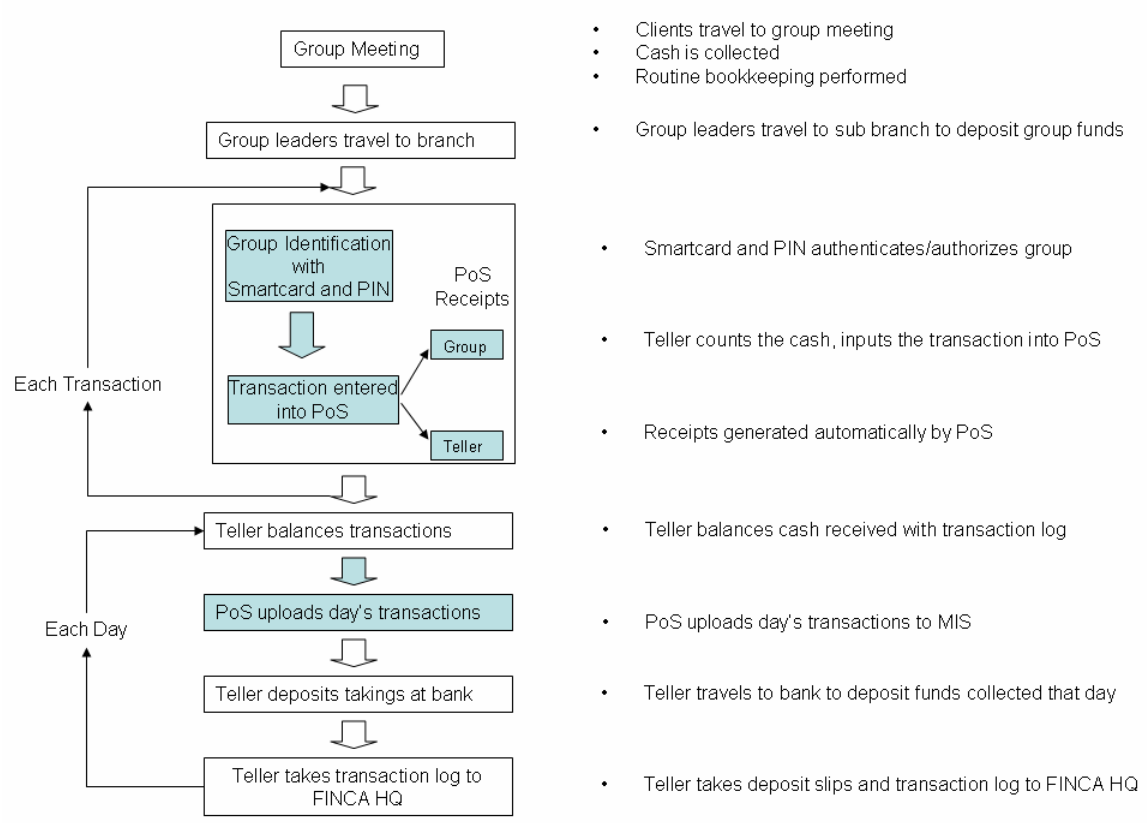
Figures 8 and 9 indicate the impact that the RTS had on the sub-branch procedures. FINCA was able to reduce the workload for tellers, as they no longer had to enter transactions manually nor did they have to hand write transaction receipts. These improvements saved the teller approximately 2 hours per week. However, these savings were considered to be small compared to the ongoing costs of the RTS and as such are not quantified in Table 12, which details the impact the RTS had on operating income. It is clear that without generating additional revenue, nor significantly reducing operating expenses, it is not possible for FINCA to deploy the RTS so that it is able to break even.

FIGURE 6: FINCA Sub Branch Procedure Prior to Introduction of RTS



- Clients travel to group meeting
- Cash is collected
- Routine bookkeeping performed
- Group leaders travel to sub branch to deposit group funds
- Teller identifies the group
- Teller counts the cash, inputs the transaction on a daily log
- Each transaction is captured in quadruplicate
- Teller balances cash received with transaction log
- Teller calls main branch to report cash position
- Teller travels to bank to deposit funds collected that day
- Teller takes deposit slips and transaction log to FINCA HQ

FIGURE 7: FINCA Sub Branch Procedure Following Introduction of RTS


Group Meeting
Clients travel to group meeting
Cash is collected
Routine bookkeeping performed
Group leaders travel to branch
Group leaders travel to sub branch to deposit group funds
Group Identification with Smartcard and PIN
PoS Receipts
Smartcard and PIN authenticates/authorizes group
Group
Each Transaction
Transaction entered into PoS
Teller counts the cash, inputs the transaction into PoS
Teller
Receipts generated automatically by PoS
Teller balances transactions
Teller balances cash received with transaction log
PoS uploads day's transactions
Each Day
PoS uploads day's transactions to MIS
Teller deposits takings at bank
Teller travels to bank to deposit funds collected that day
Teller takes transaction log to FINCA HQ
Teller takes deposit slips and transaction log to FINCA HQ

Uptake of the smart cards among groups exceeded expectations. The solution was rolled out to all 47 groups, which represented about 1,650 clients that transacted at the Nakasongola sub-branch. The sub-branch was in existence prior to the RTS pilot and its location was chosen to save the group leaders the time and expense of traveling to the branch in Kampala. The sub-branch was open two days a week to provide banking services to these groups. Tellers, who were based in Kampala, would travel to the sub-branch to provide banking services to these groups. At the end of each banking day, they would be escorted by armed guards to a bank where all the collected cash would be deposited. The teller would then return to the Kampala branch to enter the day's transactions into the MIS.

When the PoS was introduced to the sub-branch, it was used for loan payments and savings deposits. By the end of the pilot, PoS services also included village phone loan repayments and fund transfers. FINCA decided against using the PoS for withdrawals due to the security risk posed to group leaders when traveling back with large amounts of cash. Similar concerns existed for loan officers who did not travel to group meetings with cash unless a withdrawals request had been made in advance. As a result, the introduction of the PoS did not improve clients' access to funds. Nor did it reduce the frequency or duration for group meetings.

The potential impact of the POS was further reduced because smart cards were issued only at a group level and not to individual clients. Interviews with the RTS Customer Service Officer for FINCA Uganda indicated that FU was aware that some borrowers with good credit records were ready to move out of the solidarity group structure and FU was considering how to migrate such clients to individual loans. When FU is ready for such a shift, the PoS could be used to track loan repayments at an individual level during group meetings.

Group leaders enjoyed the prestige associated with the smart cards though they experienced few actual benefits from using the system, primarily because it provided no greater transparency to their FINCA accounts than had previously been available. Furthermore, the PoS had no impact on group leader travel costs or journey time. Although the location of the sub-branch reduced traveling time for group leaders, Table 10 confirms that the RTS itself provided no additional benefit for group leaders or group members.

TABLE 10: Financial Impact of RTS on FINCA Clients

Impact on transaction frequency	**No change**
• Reduce leakage by 5%	0
• Reduce Travel and Incidental costs	0
• Value of client's travel time saved	0
• Reduce cost of proxy payment services	0
• Client transaction fees for RTS Agent	0
Reduce time in group meetings	**No Change**
• Value of client's meeting time saved	0
Convert from group to individual record keeping	**No Change**
• Eliminate 2%/month loan surcharge[15]	Not Applicable
• Establish individual credit history	Not Applicable
Existing Client Savings from RTS	**0**
Client attitude to RTS	**Neutral**

The RTS did not result in any savings for the Loan Officers as these individual are salaried employees and also because the RTS had no impact on the efficiency of group meetings.

TABLE 11: Financial Impact of RTS on FINCA Loan Officers

Impact on Expenses for Field Officer	**None**
• Per client annual	$0
Impact on Revenues for Field Officer	**None**
• Per client annual	$0
Gross Margin	**No Change**

TABLE 12: Impact of RTS on Operating Income

Deployment Size	**1 Sub Branch**
Revenue – (From transaction fees and process savings)	
• Client annual fee received	$0
• MFI processing savings (reduced work volume)	$0
Expense - RTS related annual costs	
• Field RTS PoS trans airtime	($830)
• Field RTS PoS trans paper	($130)
RTS Annual operating costs	
• HQ RTS IT Sr. staff ops & support @ $700	($8,400)
• HQ RTS Training staff @ $500	($6,000)
• HQ RTS vol. IT Jr. staff ops & support @ $500	($0)
• RTSE MFI monthly support fee @$850/mo	($10,200)
Total annual HQ operating expense	**($24,600)**
RTS Operating Income	
• Operating revenue	$0
• Field operating savings from using RTS	$0
• Field operating expense for using RTS	($960)
• HQ operating savings from RTS	($0)
• HQ operating expense for RTS	($24,600)
Operating income at indicated volume	**($25,560)**

Since the sub-branch already had large capital and recurring costs, the added capital costs of the RTS hardware and smart cards, indicated in Table 13, could easily be absorbed. The largest cost for FINCA would be the ongoing technical support costs for the solution, although this cost would be reduced as the solution was scaled to other sub-branches. The cost savings for the projected volume of transactions was not going to generate an operating profit and therefore did not justify the capital or start up costs. Furthermore, the transaction volume would likely remain low, given that smart cards were only issued to groups and not individuals.

TABLE 13: Total Start-up Costs for Deployment per Sub-branch

Deployment Size	**1 Sub Branch**
RTS Capital costs (total costs):	
• MIS Connector to RTS server system	($6,800)
• Computers @ $1,500 each (PCs to start)	($4,500)
• Computers @ $1,500 each (add'l volume)	($0)
• Communication link install @50%	($0) existing
• HQ PoS devices for RTS support staff @ $700	($700)
• LO/Agent/Branch RTS PoS devices @ $700	($2,100)
• Client smart cards 16,432 / 21 / 2,235 @ $2.50	($50)
Total Capital Expense	($14,150)
Total annual depreciation exp (3 yr amortization)	($4,720)
(Grant Funded) Start-up Costs for MFI	
• RTS capital costs	$14,150
• Project Manager 2 yrs @ $1,200/mo	$28,800
• Start-up trainer & cust. support 2 yrs @$500/mo	$12,000
• Product customization	$10,000
• External start-up project & management consult	$50,000
Total Start-up Costs	**$114,950**

RTS Uganda recommended to FINCA that unless the RTS was used to accept savings and gather individual client data, FINCA would not see a positive ROI. The RTS is not a cost-effective method of automating a sub-branch that is only accepting cash from group leaders; the same effect could be achieved by issuing the sub-branch teller with a laptop installed with SIEM, FINCA's MIS software. A much higher volume of transactions is required to justify the additional infrastructure and support costs. Due to these results, FINCA Uganda appropriately decided to postpone additional rollout of the RTS until they were ready to use the solution in a more comprehensive manner.

PROJECT OUTLOOK

The vision of the MFT was to champion a breakthrough in the scale of microfinance services to the rural poor in particular. The primary purpose of the Uganda pilot was to inform this vision by building the basis of a new product, testing it, learning from it and disseminating this learning to the microfinance industry. By definition, the scope of the pilot was to be finite in terms of financing and duration; as such the MFT disbanded in May 2005 after the pilot was completed. To encourage and enable others to contribute to the RTS body of knowledge, the MFT has provided the solution free of charge to the industry. Sevak Solutions, a charitable non-profit organization, will hold the intellectual property (IP) and provide open-source license agreements to interested parties. In addition, Sevak Solutions will work to promote global dissemination of the solution, provide ongoing development of the RTS and related technologies, and support the RTS user community. An example of ongoing development has been the involvement of IDEO, the product design consultancy, which developed some design ideas for a low-cost data transmission device.

While the MFIs realized that the involvement of RTS Uganda was only going to be for the duration of the pilot, it was clear during interviews with each MFI that they expected to be able to continue with the RTS if they deemed the pilot a success. Furthermore, if MFIs were to invest and commit to re-engineering their

business processes around the RTS, then they would have to be confident that there would be access to affordable technical support in the longer term. If the RTS is to be scaleable then it cannot rely on additional donor support to fund the technical skills required to maintain the solution. Therefore local businesses and organizations need to be in place and able to provide ongoing technical assistance in line with the local cost structure. These types of businesses might need grant and other types of financial support in their early start-up phases to assist with business and market development.

RTS Uganda worked with Bushnet, an established local ISP and application hosting company, to create just such a local support team. The result has been that even though the original pilot has ceased, at least one of the pilot MFIs will continue working with Sevak Solutions and Bushnet to continue to scale the RTS. In January 2005, RTS Uganda moved their offices into Bushnet's premises and had their core team members spend 6 months working with Bushnet to familiarize Bushnet consultants with the RTS. Bushnet's immediate aim is to build an implementation and support team around the RTS and have agreed to hire key members of RTS Uganda support staff as permanent Bushnet employees from September 2005 onwards. In the future, they hope that the transacting capability of the RTS may contribute to their broader vision of providing a range of services to businesses and government agencies using their extensive wireless IP network infrastructure.

CONCLUSIONS

The MFT identified a lack of client reach in terms of delivery systems and business models as being the primary barrier to the scalability of microfinance services. The RTS was designed as a potential technological solution which would use information technology to address these issues by lowering operating and financial costs.[16] Operating costs were to be reduced by lowering transaction costs. Financial costs were to be reduced by making more accurate and disaggregated information available more quickly to decision makers, i.e., by capturing transaction data at the client level. The Uganda pilot deployed the RTS into three very different environments. These environments differed in terms of lending models, business models, MFI motivations for participating in the pilot and MFI business priorities.

The MFT piloted the RTS to evaluate its broad applicability to the microfinance industry and not to develop systems for each MFI. This approach revealed that, at a minimum, all of the MFIs were able to use the RTS to reduce the variable components of their transaction costs, but that certain lending model characteristics were required before the RTS had a more significant impact on operations. Furthermore, actual financial cost savings required supporting business process changes to be made by the MFI and these changes were often difficult to identify and implement.

Like all the MFIs, UMU took advantage of the PoS by implementing it in an environment[17] where, historically, the RTS' level of sophistication would have been prohibitively expensive and unjustifiable in terms of transaction volume or client density in the area. However, in terms of operating income, the pilot showed that the impact of the PoS is limited to cost savings unless it can be used to create consumer (in this case client) surplus in the form of reduced costs or new services or new benefits to clients. UMU created client surplus, and therefore a new revenue stream, by taking advantage of the existing cash handling infrastructure of third party agents to enable more frequent transactions and their associated benefits. This has enabled a business model which is able to distribute the client surplus between the third party infrastructure provider, the client and UMU to best expand the outreach for their services. The combination of two lending model characteristics enabled the UMU business model. These are that both cash handling and account transacting are performed at an individual client level. FINCA's use of sub-branches could be compared to UMU's use of third party agents, yet FINCA account transactions were performed at a group level. Transaction volume is lower for groups than individuals and the effect was that the variable cost savings associated with the low number of transactions was not sufficient to outweigh FINCA's fixed costs of running the RTS. FOCCAS used the RTS to track individual data, but cash handling was maintained at the group level, which prevented any client surplus from being generated since clients still had to travel to and from group meetings, which is why it was difficult for FOCCAS to break even on their RTS investment.

Our interpretation of the pilot results is that the RTS can benefit group lending models, and that clients benefit from group lending models. However, when introduced into a group lending environment, the RTS will only impact the transaction and financial costs of the MFI itself. Furthermore, if the RTS is being introduced for the purpose of increasing client outreach, the fixed costs of the system will have to be covered from this reduced subset of variable cost savings, which will reduce the outreach capability of each PoS. To avoid this, changes to the MFI's business processes would be required so as to create client surplus and take advantage of the full range of potential operational benefits. However, in the FOCCAS and FINCA pilots, such changes fell outside the scope of the pilot because they went beyond their motivations for implementing the RTS. For example, FOCCAS wanted to track individual data whilst

[16] The first two of the four levers referred to at the start of the paper. Increasing capital flow and industry dynamics were the remaining levers, but were not expected to be addressed during the pilot beyond being supported by the RTS framework.

[17] In UMU's case, Jinja is considered a densely populated area, but the financial model is based on a client density supported by less populated areas (400 clients per agent).

specifically maintaining its existing group lending model. During the course of the pilot, other priorities kept FINCA from altering any element of its lending model other than to automate its sub-branches.

By reducing the opportunities for the RTS to impact operating revenue or operating costs, an MFI places increased emphasis on the need to derive financial cost saving from the RTS. The biggest challenge faced during the pilot was how to facilitate the business process changes that would enable the MFIs to realize the potential financial cost savings from their implementation of the RTS. The challenge for RTS Uganda was that they needed to undertake a much more consultative role than they were initially prepared to take. This role was frustrated by the fact that the development team, implementation team, and management team were based in India, USA, and Uganda respectively. Furthermore, it took time for the team mindset to change from one of product implementation to product development. The challenge for MFIs was that they were required to articulate the reasons behind current lending and accounting procedures, reasons complicated by the lack of process owners able to identify discrepancies between what should happen and what did happen in practice. The result was that progress occurred once a highly iterative process was underway and, in the case of FINCA and FOCCAS, it was not possible to identify fully the required process changes prior to the end of the pilot.

The implications for MFIs are threefold. First, if business process reengineering is started during or after the implementation of the RTS, there is a possibility that the cost and duration of the implementation phase will be increased. Second, even after the RTS is deployed and operational benefits are accruing, financial cost savings will not begin to accrue until funding and management backing has been secured to support the new processes. Third, if an understanding of the business process reengineering task is gained prior to implementation, then it can be used to inform the decision as to whether the RTS will be a worthwhile investment in the context of the MFI's motivations for deploying the RTS.

The overwhelming impression gained from interviews with each MFI was of a desire to improve the quality and availability of microfinance services for their clients. In the space of 2 years, RTS Uganda has made a significant contribution to this goal by deploying a secure and flexible financial transacting infrastructure that can be accessed wherever there is a GSM signal. While different lending and business models have benefited to different extents from this technology, all the MFIs and other pilot participants have gained real benefits from the pilot. Furthermore, the microfinance industry as a whole has access to this technology through the open source community. Traditional donors have been able to harness an unprecedented quality and diversity of contributors to the problem of scaling microfinance. MFIs have benefited from an examination of their business processes identifying where client services can be improved and how best to achieve certain business priorities. The pilot has revealed that, in some cases, these goals are best achieved using the RTS and that in others the RTS can only be justified when applied to a broader set of issues. The possibility for MFIs to continue with the RTS beyond the pilot has been secured by the involvement of third party local companies that benefit from access to the RTS technology, new revenue potential, and new clients. These developments were due in large part to the continuous financial, managerial and creative input from Hewlett-Packard, the convening force behind the MFT.

GLOSSARY

ATM	Automated Teller Machine
BOU	Bank of Uganda
CA	Credit Association
CSO	Customer Service Officer
FFH	Freedom From Hunger
FINCA	Foundation for International Community Assistance
FOCCAS	Foundation for Credit and Community Assistance
FU	FINCA Uganda
GSM	Global System for Mobile Communications
HP	Hewlett Packard
ICT	Information and Communication Technologies
J2EE	Java 2 Platform, Entreprise Edition
MDI Act	Micro Finance Deposit-Taking Institutions Act
MFI	Micro Finance Institution
MFT	Microdevelopment Finance Team
MIS	Management Information System
NGO	Non Governmental Organization
PC	Personal Computer
POS	Point of Sale
RTS	Remote Transaction System
SIEM	MIS application, tailored for village banking that can be used to manage medium-sized branch configurations even in areas with poor telecommunications infrastructure (Micro Finance Solutions, Inc).
SSL	Secure Socket Layer
UMU	Uganda Microfinance Union
USAID	United States Agency for International Development

Group lending	Typical microlending programs loan small amounts of money to a group of borrowers. The interest rate on the loan usually falls between the formal and informal sector rates. The money is lent to a group of borrowers (often sequentially) that chooses its own members. The group is held jointly liable for the loans (from S*ocial Identity and Group Lending*, Prabirendra Chatterjee and Sudipta Sarangi).

APPENDIX A

Hardware Components

POS Terminal

The PoS Terminal allows agents of a microfinance institution to collect and distribute funds related to savings and loans in a manner that is professional, builds trust with the clients, and helps to ensure adequate accounting and safeguards at the collection end of the system.

When the RTS system was initially designed, it was fully understood that the solution would have to work in areas where there was erratic electricity, limited connectivity, potential extremes in temperature, dusty conditions, and with customers that may not have alpha literacy skills. The final cost of the solution was also an important consideration because the RTS would not be replicable at scale if microfinance institutions could not justify its purchase through a realized return on their investment. For these reasons ATMs and PDAs were eliminated as appropriate transacting devices since they did not meet even the basic needs assessment.

The Lipman Nurit 8000 was chosen because it met the following requirements:

- Rugged design and battery power
- Programming interface that utilized JAVA, an IT industry standard
- Support and distribution available globally for future usage scenarios
- Built-in GSM capabilities
- Built-in Smart Card reading/writing capabilities
- Built-in Printer

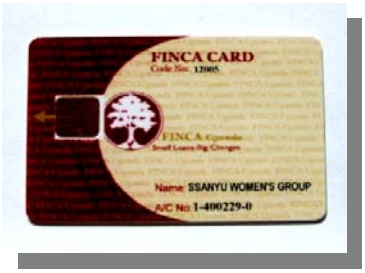
FIGURE 8: Overhead View of Lipman Nurit Device with Test Smart Card

Although the RTS solution was developed on the Lipman Nurit 8000, the software was written with the expectation that it would need to be ported to other devices. The solution should require only minimal alterations to run on other PoS terminals.

Smart cards

The first step in the transaction process is authorizing and authenticating both the agent and the client. This is accomplished through an interaction between the smart cards and the PoS terminal. These smart cards allow secure identification of both MFI agents and clients as well as the storage of key data, such as account numbers and account balances. Authentication is ensured by associating each smart card with a PIN, which must be entered prior to each transaction. Additionally, agent cards are associated with a specific terminal so that it can't be used on other terminals. The client card is used by the client as a secure passbook. Using their card and their PIN number, the client can make deposits, withdrawals, repay loans, and transfer funds. During the transaction process, the PoS device updates the account balances on both the agent and client cards. The combination of smart cards and PoS devices enable microfinance institutions to extend services to rural clients, even when there is limited connectivity because the RTS can function in an offline model.

FIGURE 9: Example of a FINCA Client's Smart Card



Though seemingly simple from a first world perspective, the use of smart cards brought significant challenges to the RTS Uganda team. An optimal low-cost solution for printing of these cards in Uganda has proved elusive. Therefore, the team has sourced and is starting to print

cards in India. A local Ugandan company is emerging that will likely provide these services in Uganda in the near term.

The card contains client numbers, account numbers, account names, account types and account balances. After a successful transaction, the client card contains the new balance of that client's accounts; this allows the card to be used in offline and online modes.

RTS Server

Transaction requests from PoS terminals are handled by an RTS server, which consists of a specially developed application that runs on standard PCs.

FIGURE 10: RTS Server Room at Bushnet

Attaching another PC to the system is a quick and easy way to scale, accommodating client growth as needed. This approach was taken because it is very low-cost and easy to maintain. The RTS server software was built with leading-edge technology tools, and takes advantage of web services in a very flexible development environment. Users can access the RTS server through the Internet.

The RTS server also runs software that allows it to send information to, and receive information from the MIS software of the participating microfinance institution. This component is known as the MIS Connector. For the pilot, connectors were built to Crystal Clear's Loan Performer product, Craft Silicon's Banker's Realm, and FINCA International's SIEM software.

It was decided to house the RTS servers for all three MFI's at the datacenter of a local internet provider, Bushnet. This decision was made because the datacenter could provide a level of support and access that was not available at any of the microfinance institutions, such as:

- Stable, reliable electricity
- Stable, reliable, high speed GSM and Internet connectivity
- Firewalls to protect the computers against viruses, a rampant problem in the initial phases of the pilot
- Highly skilled technical support staff that could troubleshoot problems immediately
- Ability to share costs of support across all participating institutions

The RTS server software is easy to use and maintain. If the system fails, the technical support engineer simply turns off the server and reboots the machine. This usually resolves any problems with the software itself. The console screens, accessed through the web, are also very straightforward and easy to use.

Network Components and Data Considerations

POS devices communicate with the RTS Server via the GSM network. Bushnet has an extensive wireless network infrastructure throughout Uganda. As a result, MIS machines are connected to the RTS Server over a secure LAN using Bushnet's private network. Communication between PoS and RTS Server is encrypted, as is communication between RTS Server and MIS and between MFI client machine and RTS

web server. In addition, requests and responses between the RTS Server and PoS device are compressed to reduce GSM air time charges.

Software Components

The RTS Server software and Management Console

To be applicable 'industry-wide,' the RTS server software had to be affordable, scalable and replicable. By developing the software in accordance with the J2EE standard, the solution is scaleable and can be deployed on a range of hardware and operating systems using freely available J2EE container software. When the RTS Server receives a request from POS device it performs the following functions:

- Checks the request for completeness.
- Validates authenticity by checking card data against the credentials maintained by the server.
- Formats and transforms the data to be sent to the MIS backend via the RTS-MFI connector.
- Invokes the connector passing the data to the microfinance institutions' accounting, or MIS, system.
- Sends confirmation to the POS after it receives information from the MIS. MIS Connector Software.

RTS – MIS Connector Software

The role of the connector software is to allow the RTS server software to communicate with different MIS systems without having to make changes in the MIS or RTS Server code. The complexity of the connector software is determined by the extensiveness of the API exposed by the MIS and by the extent of differences in the data structures expected by the two systems. The majority of the connector code was written by the RTS developers, however where there were incompatibilities in data structures or API calls, the MIS vendors had to make changes.

POS Software

The POS software consists of a java application developed by the RTS team which runs on top of the POS operating system. For security reasons, each version of the POS software will only work with a specific POS terminal. The POS software needs to know how to contact the RTS server for the correct MFI. Once connected, the POS must connect to the RTS server for the correct MFI, currently this is achieved by hard coding the RTS Server IP address into the POS software.

Mode of Operation

Originally the RTS was envisaged as a real time online system, meaning that during each transaction, the POS terminal connected through the RTS server to the MIS back-end where it retrieved updated information on account balances. However, GSM connectivity proved less reliable than anticipated because of weather conditions and also because during periods of network congestion cellular providers give priority to voice calls over data calls. Furthermore, in the context of group meetings, connecting to the RTS sever for each client transaction extended the group meeting time considerably, which generated complaints from MFI clients. In addition, air time charges were high due to the increased proportion of time spent shaking hands while the POS and RTS servers interacted for each client's transaction.

In response to these discoveries, the RTS was changed to support an offline mode. These changes affected the POS software. In an offline mode the POS is unable to connect to the RTS server to see if there are sufficient funds for a withdrawal or to update the RTS server with a deposit, therefore an increased level of intelligence needed to be added to the POS software. In the offline mode, the POS performs a series of

checks to ensure that clients are not withdrawing below minimal balances, that they do not withdraw too much money each day, and so on. The POS saves a record in memory of each offline transaction and uploads these transactions to the RTS server the next time it is connected. The uploading of these transactions is, in effect, a batch upload of transactions which is efficient in terms of air time charges and connection time. Group meetings for FOCCAS and FINCA now operate in batch mode, regardless of GSM availability.

A drawback of the offline mode is that the longer the smart card is not synchronized with the RTS server, the greater the chance that an update to the account via the MIS directly will invalidate the balance stored on the smart card. In the group model, internal MFI staff manages the smart cards and the POS devices. Procedures have been put into place to ensure that account balances get updated when they are out-of-synch. This can occur when a client forgets to bring her card to a meeting, for example. However, in the merchant/agent model, this level of management is not as straightforward, making it more difficult for UMU to function in a purely offline mode. The development team and UMU are currently working together to find both software and procedural solutions to this problem. In the meantime, UMU has been shifted to a mode that shifts between online and offline functionality.

APPENDIX B

FIGURE 13: Pair of Receipts for Transaction Reversal

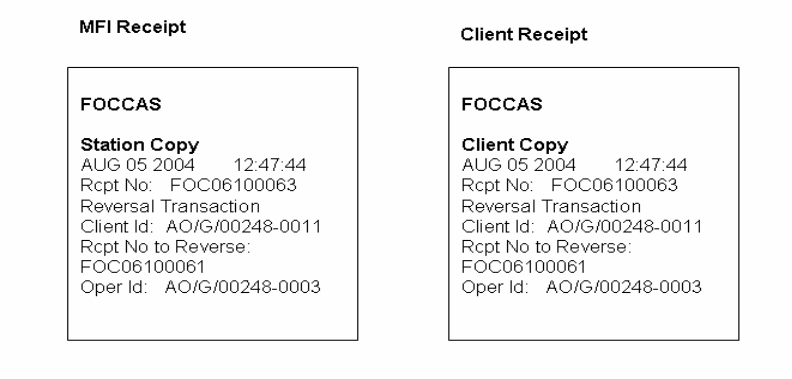


FIGURE 14: Sample Summary Report

FIGURE 15: Sample Quick Reconciliation Form

APPENDIX C

We would like to thank the following people for taking the time to answer our questions.

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